IN THE UNITED STATES PATENT &TRADEMARK OFFICE

RE:
Application Ser.No.10/733,331
Filed: 12/12/2003
Inventor: GLYNN, Donald R.
Title: System for Separating Oil from Water.

Examiner: Krishnan S. Menon
Art Unit 1723

June 14,2006

DECLARATION

I, Donald R,Glynn, a Canadian citizen residing in Toronto, Ontario, Canada, hereby Declare and state that:

1. I am the above named inventor of the subject Application;

2. I have been employed full-time in the field of treating oily waste water from 1990 – to the present

3. From personal experience in the commercial utilization of single-element cross-flow filters, and with significant experience in other types of waste-water filter treatment, I wish to make the following observations concerning the feasibility and technical relevance of combining prior art filter systems in the manner suggested in the Office Action of 03/16/2006.

4. Paragraph 1 of the Claim Rejections rejects Claims 1-3, 5, 7, 12 & 13 as being clearly anticipated by Falletti (US 4,865,742)

Falletti follows the traditional approach of using large, multi-bundles of sintered filter elements (see her Figures 1 & 2). In contrast, the module of the subject application comprises a single filter element located in a close-fitting filter housing, with a very close-tolerance radial clearance between the stainless steel housing wall and the outer surface of the ceramic element, serving as the permeate drainage space. This

surface-to-surface clearance distance of a subject module typically averages two millimeters, i.e. 0.07874 inches.

The significance of this minimized permeate collection space is that the space also receives, and is filled with the chemical cleaning solution/solutions, used during the subject back pulse chemical cleaning regimes. The subject apparatus and its cycles have proven their commercial viability because the minimization of volumes of cleaning solutions required, permits the economic employment of frequent, automated cleaning cycles.

In addition, the minimized volumes of cleaning fluids required also enables rapid temperature rises by circulation pumping of the cleaning liquid, with consequent short cleaning time requirements, thus optimizing the on-line utilization factor for the system.

5. In the past year one of my subject installations has been upgraded by the lessee (user) to handle one million litres a year of oil-contaminated waste water, a 66% increase in throughput, thereby validating the significant economic value resulting from the revolutionary use of filter units employing a single filter element.

6 The reliable and effective use of modules containing a single filter element effectively miniaturizes the process, with concomitant savings in size, space, capital as well as cleaning chemicals.

This in turn minimizes the ecological impact, in the disposal of used chemical cleaning solutions, and perhaps more importantly, in a massive reduction in truck transportation for disposing of the now highly-concentrated oil-contaminated waste water, where an oil concentration of 35 to 40 % (from an original approx 2% oil concentration) has removed 90 to 95 % of the water that had previously had to be trucked away.

7. Combining Haney with Falletti does not in any way address this structural characteristic of the prior art, which renders it totally unsuitable for the required use.

Haney's use of a rolled up plastic reverse osmosis filter bundle bears no relation to the rigid sintered ceramic membrane element used in my system, and I would not expect to find useful subject matter in such non-analogous art.

Haney's water treatment system is of the type utilizing reverse osmosis and/or nanofiltration thin film membrane separation technology.

The pore size difference between Haney's filter and my ceramic cross-flow filter is like comparing the pore size of my ceramic filter to a paper coffee filter.

Haney filter(pore size)	.0001 to .001	micron	(plastic)
My ceramic filter (pore size)	.01 to .1	micron	(ceramic)
Coffee filter (pore size)	10 to 100	micron	(paper)

8. The disparity of characteristics between reverse osmosis membranes. and their cleaning requirements and a ceramic cross flow filter is so vast that I would never have considered adapting something so "foreign" to my needs. My provision of the present system was the result of many years of applied and often tedious investigation and experimentation, and not by the mere expedient of consulting non-relevant prior art.

9. Concerning Haney's views of chemical cleaning, he states, at Col. 6, Lines 31-37:

"The currently available conventional membrane separator apparatus have many undesirable characteristics. Of these undesirable characteristics, the most undesirable are: a) the low life expectancy of membrane separators operated in the conventional manner due to chemical cleaning requirements and pre-treatment failures"

If Haney in fact did use chemical cleaning of membranes in his invention he would experience, by his own admission "low life expectancy" of the filter membrane due to chemical cleaning solution attack on the (plastic) membrane surfaces. The ceramic membranes of the present invention stand up to aggressively hot chemical solution cleaning.

An automated stand-alone system such as mine could never be based on plastic membranes. Consequently, I would not expect to consult any such prior art to solve my problems with the cleaning of a ceramic filter.

10. A filter membrane's flux flow rate degrades while in operation. However the ceramic membranes of my system, with chemical cleaning after fouling, will recover normal operation flux flow. Our back-pulsed chemical cleaning solutions will even recussitate a membrane that has become fully fouled due to tramp oil (free oil) contamination.

My use of ceramic filter modules enables my process to operate in a fully automated fashion, to "recover" our ceramics filters, and restore them to acceptable flux flow rates. My adoption of single ceramic filter cartridges, close fitted in their housing has enabled back-pulsed chemical cleaning to be effective, and the means by which the various solutions are enabled to be administered, through automated valves/PLC controllers is a significant feature of my total system. The use of my automated system drastically reduces maintenance labour costs

11. Regarding my use of a plurality of cleaning solution tanks. Haney teaches only one, non-chemical tank, acting solely on the permeate side in back-flush mode. Referring to Haney (Col. 19, Lines 29-39)

"This is done to **force** water through the membranes in a direction opposite to normal flow, thereby cleaning the membrane separators 106 by removing particulate material built up on the membranes which can not be removed by merely flushing the membranes. This cleaning method **removes the need for chemical cleaning** of the membrane separators." **[emphesis** added]

12. Ceramic UF membranes will stand up to aggressive chemical treatment and most manufacturers of ceramic membranes provide literature advising the use of a range of chemical cleaning agents **that are re-circulated within the ring as the preferred traditional approach**: i.e. in the same flow direction as normal operation.

The manufacturers of ceramic membranes do not recommend back pulsing of hot chemical solutions, as taught in the present invention, **but treat only by circulation of cleaning solutions around the ring** in the usual operational direction. My use of two auxiliary reservoirs depends upon oscillatory pulse cleaning, including back-pulse circulation.

One aspect of the successful back-pulsing of hot chemical cleaning agents in accordance with the present invention is the adoption of filter modules containing a single filter element in close fitting relation with the enclosing housing, to provide a minimal permeate drainage space, which space serves also to contain the cleaning chemical, when it is being administered.

13. Haney's references to accumulator tank storage means (Fig. 2 #24) and inverse flow

pump means (Fig. 2 #25) provides only for the reversed pumping of filtered water backwards through the membrane. There are no side connections to chemical storage means or delivery systems, either shown or suggested in the text.

Haney (Col. 31, Lines 9-32) refers to his water back-flushing process - "replaces damaging chemical cleaning of the membrane separators." Clearly Haney's invention at all times tries to avoid chemical cleaning.

14. The examiner states, in his reason for rejecting the present plurality of tanks and automatically controlled back-pulsed cleaning solutions that "Haney teaches multiple cleaning reservoirs as known in the art (L, figure 1: prior art)". However, while Haney makes indirect reference to prior art illustration of multiple cleaning reservoirs, this is clearly not Haney's preferred mode of operation.

It is very evident that Haney's back-flushing with water is in no way an equivalent to the presently taught aggressive use of back-flushing with hot chemicals.

Clearly the presently taught approach, of using an aggressive industrial washing detergent at elevated temperature, back-pulsed through a ceramic membrane, will clean oily residue off the membrane surface far better than Haney's ambient-temperature back-pulsed water. The evident ineffectiveness of Haney's teachings in regards to back-flushing would not lead anyone considering the existent problem to move towards Haney's solution to the problem.

The present invention employs a range of cleaning solutions, not being restricted to just detergent solutions. This also is reflected in the claimed multi-tank apparatus subject matter.

15. The teachings of Haney as regards back-pulse cleaning are silent in regards to raising the temperature of the cleaning fluid, as presently taught by way of pumped circulation. It is well known that solvent activity is greater at elevated temperatures, yet Haney does not heat his back-pulsed water.

Simply put, Haney is not using solvent-action cleaning methodology. Haney is relying solely on the physical thrust of back-pulsed water to clean his membranes. Hence his teaching diverges away from the prior art use of multiple cleaning reservoirs.

16. In the matter of heating the subject back-flushed solvents, the minimizing of the size of my permeate space plays a significant role in the efficient utilization of the separation apparatus, on all aspects of which the cited prior art is silent in terms of both structure and function. The restricted, minimized volume of cleaning chemical used in my apparatus is readily and rapidly heated by the expedient of circulatory pumping.

Haney is silent as to what chemicals are used, or how they are applied, or dealt with. Nor is there any mention of heating of the chemicals. These aspects of the handling and utilization of the cleaning chemical solutions are all dealt with in the present invention, where in-situ cleaning is the modus operandi.

17.. Concerning the filter module as taught by Trulson, this is the traditional approach of using large, multi-bundles of ceramic filter elements (see his Figures 2 and 4).

Trulson is silent concerning the all-important module spatial limitations now set forth in the claims. The physical characteristics now set forth in the claims are of profound significance in the operational efficacy of the process, as taught in the present application, and which clearly differentiate over Trulson's apparatus.

18. Regarding the present double O-ring seal arrangement, this is not shown in any of the patents cited. Because of the pressures and solution velocity utilized when back pulsing chemical cleaning solutions, a double O-ring seal assembly is highly desirable, to avoid cleaning solutions present in the permeate space from directly entering the re-circulation ring volume space, made possible by dislodging the O-ring seal of a single-seal installation.

More importantly, when the processor is put back in service after cleaning with chemical solutions a dislodged single O-ring seal would permit waste oily waters to pass directly to the permeate (treated) water side of the processor. We discovered that single O-ring seals can become dislodged when cleaning solutions are back-pulsed in the manner of our invention. One might wonder why we would engineer and build such a ceramic filter sealing device if there were no need. Since the examiner has cited no earlier showing of multiple O-ring end seals, the claimed novelty of this arrangement appears to be justified. The alleged equivalence between gaskets and O-ring seals is strenuously contested. The practicality of this provision has been demonstrated, and its value clearly established.

Further, the Declarant sayeth not.

Signed at Toronto, Ontario, Canada, this 14th day of June, 2006 Donald Glynn

Donald R.Glynn